ADEQ

ARKANSAS
Department of Environmental Quality

November 10, 2011

Claudia Hosch (6WQ-P)
Associate Director
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Comments on the Quality Assurance Project Plan: Modeling QAPP and the Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed Documents

Dear Ms. Hosch:

The Arkansas Department of Environmental Quality (ADEQ) would like to thank Region 6 Environmental Protection Agency (EPA) for allowing us to review and provide comments on both of Aqua Terra's August 29, 2011 draft "Quality Assurance Project Plan: Modeling QAPP" (Modeling QAPP) and the draft "Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed" (Model Simulation Plan) deliverables. It is apparent to the ADEQ that considerable time and resources have been given in preparing both documents and commend both the EPA and Aqua Terra on their effort. Our comments include general and specific comments on the draft Modeling QAPP and Model Simulation Plan.

A review of both the Modeling QAPP and the Model Simulation Plan has shown that many, if not all, of ADEQ's concerns in the Model Simulation Plan and Data Adequacy Issues sections of the January 14, 2011 comments letter to EPA have gone unaddressed. A copy of this comment letter has been attached for your convenience and should be used to revise the Modeling QAPP and Simulation Plan to address those comments.

Although, the ADEQ is encouraged by the inclusion of a Sensitivity Analysis which could aid in determining the appropriateness of older data, we continue to be very concerned that an uncertainty analysis will not be performed due to "funding" restrictions. As stated in the January 14, 2011 comment letter "Uncertainty analysis should be performed to determine the variability and uncertainty in model outputs associated with variability and uncertainty in model inputs. Without an uncertainty analysis, the utility of the model to predict outcomes for critical parameters is compromised." Due to costs associated with treatment for Arkansas point sources, the ADEQ cannot stress enough that limited time and resources must not impede the proper development of the HSPF model. If funding is an issue, EPA should reconsider inclusion of Lake Tenkiller in the TMDL development. As previously stated, inclusion of the lake into this modeling effort seems to range far beyond the scope of the TMDL.

The ADEQ submits the following specific questions and comments associated with the Modeling QAPP and Model Simulation Plan. In addition to the ADEQ's comments, I have attached copies

of two comment letters from Arkansas stakeholders (the City of Siloam Springs and the City of Rogers).

Modeling QAPP Questions/Comments:

1. Section 2.0 Problem Definition/Background: This paragraph describes changes that have occurred in Arkansas related to "fast-growing urban areas" and "intensive agricultural animal production." There have been changes in Oklahoma that should be similarly described. Further the geomorphological characteristics of the Illinois River in Arkansas are vastly different than that of the Illinois River in Oklahoma. These differences should be characterized.

2. Page 8 notes that 1992 and 2001 land use data will be used. Even though the model will be calibrated and a sensitivity analysis performed conditions in the area have changed significantly from those dates and ADEQ questions the usefulness or appropriateness of the data.

3. Modeling QAPP Section 6.1.3: The draft appears to indicate that simplified soil erosion and municipal runoff subroutines will be used. ADEQ staff questions whether the simplified subroutines are appropriate and representative of conditions in Northwest Arkansas and Northeast Oklahoma given the potential TP contributions from soil erosion.

Model Simulation Plan Questions/Comments:

1. Please revise Figure 1.2 according to the most recent Arkansas 303(d) list. Arkansas does not have any stream segments in the Illinois River Watershed listed on the 2010 303(d) impaired waterbodies list for total phosphorus.
2. Section 2.4 states "The specific constituents to be modeled in this study include all constituents needed for modeling nutrients with a specific focus on phosphorus species." Section 1.1 states that the goal of the study is to determine reductions needed to meet state water quality standards. In order to attain this goal, the list of parameters to be modeled will have to be expanded to address all of those constituents that exceed state water quality standards and lists phosphorus as the cause – turbidity, bacteria, aquatic life, all constituents affecting aesthetics.
3. Section 6.2 under the Water Temperature Calibration section. How is canopy cover or the lack of canopy cover used by EPA and Aqua Terra to determine the impacts on temperature?
4. Section 6.2 Instream Sediment Calibration. How will the model take into consideration short-term, high intensity storm events that do not cause a significant increase in instream flow, but can add significant amounts of sediment?
5. Simulation Plan Section 4.3: Because historical data that is known to be no longer representative will be used in the model development and calibration, ADEQ staff would like clarification as to whether the scope of work includes adjusting the "calibrated"

model to account for future data that is collected that will reflect current conditions in the watershed after the TMDL is completed?

Again, we thank you for the opportunity to provide comments and look forward to working with EPA as it proceeds to finalize the Model Selection Memo and begins drafting a Simulation Plan. If you have any questions concerning these comments, you can contact me by phone at (501) 682-0629 or by email at bailey@adeq.state.ar.us.

Sincerely,

John Bailey, P.E.
Permits Branch Manager, Water Division

Attachments:

1. October 21, 2011 letter to Mr. John Bailey, ADEQ, from Tom McAlister, Rogers Water Utilities, Regarding Comments on "Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed" and "Quality Assurance Project Plan: Modeling QAPP" Prepared by Aqua Terra Consultants.

2. October 24, 2011 letter to Mr. Miguel Flores, EPA from David Cameron, City Administrator for the City of Siloam Springs Regarding Comments on – Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed and – Quality Assurance Project Plan: Modeling QAPP – Prepared by Aqua Terra.

3. January 14, 2010 letter to Claudia Hosch, Associate Director, U.S. Environmental Protection Agency, Regarding Comments on the Memorandum for Model Selection for the Illinois River TMDL in AR/OK Prepared by Arkansas Department of Environmental Quality.

cc: Teresa Marks, Director, ADEQ
Ryan Benefield, P.E. Deputy Director, ADEQ
Steve Drown, Water Division Chief, ADEQ
Sarah Clem, Water Quality Planning Branch Manager, ADEQ
Robert George, V.P. & Associate General Counsel, Tyson Foods, Inc.
J. Randy Young, P.E., Executive Director, ANRC
Tom McAlister, Director, Rogers Water Utilities
Steven A. Thompson, Executive Director, Oklahoma Department of Environmental Quality
J.D. Strong, Water Board Director, Oklahoma Water Resource Board
Tom Elkins, Administrator for Cherokee Nation Environmental Programs, Cherokee Nation
Brandi Ross, Natural Resources Director, United Keetoowah Band

ROGERS WATER UTILITIES

"SERVING ROGERS - PROTECTING THE ENVIRONMENT"

October 21, 2011

Mr. John Bailey, P. E.
Water Quality Division
ADEQ
5301 Northshore Drive
North Little Rock, AR 72118-5317

Re: Comments on "Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed" and "Quality Assurance Project Plan: Modeling QAPP" Prepared by Aqua Terra Consultants

Dear Mr. Bailey:

Enclosed please find the City of Rogers' response to the draft "QAPP" and the draft "Simulation Plan" for the Illinois River Watershed, submitted to USEPA by Aqua Terra. Please forward our response to Quang Nguyen. If you have any questions or comments about his, please advise.

The City of Rogers, Arkansas appreciates the opportunity to provide comments on the following documents prepared by Aqua Terra Consultants: 1) "Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed" and 2) "Quality Assurance Project Plan: Modeling QAPP." We retained Wright Water Engineers, Inc. (WWE) to review the documents and this letter provides the results of their review, which was conducted by Jonathan Jones, P.E., and his staff at WWE and Dr. Larry Roesner, P.E., Ph.D., of Colorado State University. In addition to providing general review of the documents, particular attention was given to whether the Simulation Plan addressed comments previously provided by Arkansas stakeholders to the Environmental Protection Agency (EPA) Region 6. WWE's review focused primarily on the HSPF component of the documents, with only cursory review of the Lake Tenkiller model.

Although some issues that the City of Rogers and other Arkansas stakeholders raised in previous comment letters remain, we appreciate Aqua Terra's efforts to address our comments in several technical areas. However, we are concerned about Aqua Terra's clear statement that uncertainty analysis is not part of the project's scope. Although we provide some detailed comments in the remainder of this letter, the lack of uncertainty analysis is our overarching concern for this effort. At the end of this effort, the bottom line will be: **"How certain are EPA and Aqua Terra that the results will be sufficiently accurate to justify the expenditures of millions of dollars on phosphorus reduction practices?"** Throughout the Simulation Plan and QAPP, Aqua Terra documents uncertainties associated with various input parameters, known data limitations, and assumptions that will need to be made. These inherent uncertainties will affect confidence in model results. We expect that the model outcomes will result in substantial financial expenditures on the

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behalf of many local governments. We continue to strongly urge EPA to provide adequate budget and scope to Aqua Terra to complete this important step of the modeling process.

Other comments resulting from review of the Simulation Plan and QAPP are summarized in the remainder of this letter.

Comments Regarding "Quality Assurance Project Plan: Modeling QAPP"

1. Page 10 states: "It is worth noting that supplemental data quality assessment will be achieved within the context of the initial model simulations. It is common practice to identify and correct problems associated with various data sets and data types when potential problems are revealed by unexpected or unrealistic simulation results during the early stages of model setup and calibration." Comment: We have some concerns about modifying a data set in order to match model simulation results. Please explain the types of changes to the data that would be made at this stage of the process. We would like more information on the nature of the corrections that may be made as part of this process and how these corrections will be documented.

2. Page 11, Section 3.6. Table 3.1 lists the deliverables schedule for various reports and the modeling effort. Comment: The table does not identify when stakeholder comments will be addressed. All final documents, including QAPP's and the Data Report were scheduled for completion in September 2011; however, most documents are still in draft form. Is the deliverables schedule being re-evaluated and will consideration be given for additional time for Aqua Terra to address stakeholders' comments prior to model development?

3. Page 17. "To a large extent, the quality of the modeling study is determined by the expertise of the modeling and quality assessment teams, in addition to the available data. The ultimate test of quality for this study, however, is that the model output is a sufficiently accurate representation of the natural system to address the site-specific study objectives/data quality objectives listed below." Comment: We agree that this is one of the fundamental questions for the project: "are the data and model sufficiently accurate to estimate the reductions in loads that are necessary to achieve such a low phosphorus standard?" We have interest in the level of confidence achievable for the model results and believe that a thorough uncertainty analysis is needed for this purpose.

4. Page 17. "The proposed modeling study design was developed to (1) represent the full range of physical, chemical, and biological processes of concern for phosphorus fate and transport in the Illinois River Watershed.... The determination of whether the DQOs have been achieved is less straightforward for a modeling study than for the more typical sampling and analysis type of study. The usual data quality indicators (e.g., completeness, accuracy, precision) are difficult to apply and in many cases do not adequately characterize model output..." Comment: Are the model representations of these processes and model outputs sufficiently accurate to simulate very low instream phosphorus concentrations?

5. Page 20. "HSPF was selected for the watershed because it provides a strong dynamic (i.e. short time step, hourly) hydrologic and hydraulic model simulation capability, and a moderately complex instream fate/transport simulation of sediment and phosphorus, both of which are linked to soil nutrient and runoff models..." Comment: We have some questions about how

well HSPF simulates the land-based generation of pollutants, their entrainment into the runoff, transport to the receiving water, and the removal of these pollutants by BMPs.

6. Page 22 bullet list:

   "c. The HSPF soil nutrient models provide a complete mass-balance approach for simulating nitrogen and phosphorus balances and runoff components, with detailed nutrient cycling of both organic and inorganic nutrient forms. This capability allows a direct connection between nutrient application rates from chemical fertilizers, manure, and poultry litter, and subsequent soil buildup and potential runoff to rivers and streams, from applied pasture lands, subject to limitations of the available data."

   "d. The sediment transport and instream water quality capabilities of HSPF provide a moderately complex process-based representation of the fate and transport processes for nutrients, including phosphorus, along with sediment-nutrient interactions, scour/deposition impacts with the sediment bed, and combined uptake/cycling of phosphorus by algae and DO/BOD processes."

   Comments on c & d: How accurate are these capabilities, particularly with regard to characterizing inter-storm and intra-storm processes?

7. Page 23. "For runoff loadings of water quality constituents, HSPF provides alternative methods, among which the user can select, to calculate loadings either with simple, empirical build-up and washoff algorithms used in the PQUAL subroutine, or the detailed mass balance formulations used within the group of subroutines within the dashed-line box marked as AGCHEM." and Page 24: "For the IRW application of HSPF, we plan to utilize the AGCHEM subroutines for the pasture lands that are the primary recipients of fertilizer, manure, and litter applications, and then use the simpler PQUAL routines for all other land uses." Comment: We have some concerns about buildup-washoff algorithms because it is not clear whether they adequately simulate the intra-event storm load from a watershed.

8. Page 33. "For water quality constituents, model performance will be based primarily on visual and graphical presentations as the frequency of observed data will likely be inadequate for accurate statistical measures." Comment: This is important to keep in mind with regard to the accuracy of simulated water quality results and reinforces the need for uncertainty analysis.

9. Page 34. "The objective of the calibration effort for the Illinois River Watershed HSPF model is to establish parameter values that produce the best overall agreement between simulated and observed values throughout the calibration period." Comment: How will "best" be determined, especially in light of the fact that "the frequency of observed data will likely be inadequate for accurate statistical measures."

10. Page 35. "A complete hydrologic calibration involves a successive examination of the following four characteristics of the watershed hydrology, in the order shown: (1) annual water balance, (2) seasonal and monthly flow volumes, (3) baseflow, and (4) storm events. Simulated and observed values for reach characteristic are examined and critical parameters are adjusted to attain acceptable levels of agreement (discussed further below)." Comment: What parameters

are adjusted if the simulated storm hydrology does not produce the measured runoff? The watershed is very large; how will spatial variation in storm precipitation be handled? This area of the country gets severe local thunderstorms that will produce heavy runoff from some areas and not from other areas. We think this is important in calculating the spatial variation of the pollutant mass washed into the receiving waters.

11. Page 38. "Sediment calibration follows the hydrologic calibration and must precede water quality calibration. Calibration of the parameters involved in simulation of watershed sediment erosion is more uncertain than hydrologic calibration, due to the comparably smaller number of sediment simulations that have been performed in different regions of the country."...and..."In HSPF, the erosion process is represented as the net result of detachment of soil particles by raindrop impact on the land surface, and then subsequent transport of these fine particles by overland flow." Comment: These processes are important potential sources of error that warrant careful attention. How is instream bank erosion calculated and how is the difference between channel erosion and watershed erosion distinguished? Instream water quality results reflect the sum of these two sources.

12. Page 39. "The strategy that will be used to simulate nutrients for the Illinois River Watershed study will utilize both schemes, with BOD, nitrate and ammonia simulated as a function of runoff rate and phosphate simulated using...." Comment: How will organic nitrogen (i.e. Kjeldahl N) be simulated?

13. Page 41. "Observed stormwater concentrations for each contaminant will be compared with model results, and the pollutant loading rates by land use category will be compared with the expected ranges available from the literature and past modeling studies, in a manner analogous to the sediment loading calibration." Comment: Will the "expected ranges from literature and past modeling studies" be focused on those conducted in the Illinois River Watershed and/or comparable watersheds in geographic proximity?

14. Page 54. "The current scope and funding of the Illinois River Watershed TMDL Development project does not include performance of uncertainty analysis. However, if the scope is subsequently expanded..." Comment: As stated at the beginning of this comment letter, this is a fundamental issue. Only uncertainty analysis can tell what impact the uncertainty in a model parameter or estimate of pollutant loading will have on the certainty of the simulated in-stream quality.

Comments Regarding "Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed"

1. p.12, Section 1.5 characterizes the fact that Section 6 discusses some remaining issues and considerations that will need to be resolved as the process continues. This section addresses important issue such as karst conditions, phosphorus source issues, poultry litter representation and TMDL alternative modeling scenarios. Comment: How will Arkansas stakeholders be included in this process, given the critical importance of these issues? Can more information be provided on the review process for these types of technical issues?

2. Page 26 and Page 45 discusses issues related to the poultry litigation database and expert reports and "the plan to use only data from this database that provides unique and significant value to the modeling effort…when such data is identified, it will be reviewed…" Comment: Similar to comment 1 above, how will Arkansas stakeholders be included in this process, if these data are used?

3. Page 41, regarding channel characteristics. Comment: We agree with Aqua Terra that actual cross-section data at various points in the stream are preferred. We believe it is important to obtain these cross-sections because the accuracy of the model will be further reduced without accurate specification of channel geometry.

4. Page 58, regarding the statement: "Nutrient loading from wastewater facilities, watershed runoff and large-scale agricultural poultry production are suspected of contributing to impairments of many segments of the Illinois River, other streams in the watershed and eutrophication of Lake Tenkiller. In order to develop scientifically defensible tools that can be used for state/local planning purposes to meet water quality management goals in Arkansas and Oklahoma a linked surface water modeling framework is being constructed to account for flow and pollutant loading within the Illinois River watershed and the effects of watershed flow and loading on water quality conditions in Lake Tenkiller." Comment: These statements contain some inaccuracies and mischaracterization of concerns and interests of Arkansas entities, which have been expressed in previous comment letters from Arkansas stakeholders.

5. Page 19, Sections 2.3 and 2.4 – These sections discuss the availability of streamflow and water quality data for both Arkansas and Oklahoma. Comment: There appear to be 17 gage locations within the Illinois River Watershed that contain both streamflow and water quality data. However, the Simulation Plan does not explicitly state which or how many gages will be used for calibration/validation. Selection of gages used for calibration/validation could potentially have large implications on the reliability of the model. Will a discussion of why certain gages were selected over others be included in the final data report?

6. Previous Arkansas stakeholder review comments have raised concerns regarding the temporal context for calibration and validation. For example, the City of Springdale Arkansas completed upgrades to its wastewater treatment plant (WWTP) in 2004 that reduced TP in the outfall to Spring Creek from >5 mg/L to <1 mg/L. Only after 2005 did in-stream total phosphorus (TP) concentrations begin to reflect the total impact of Springdale's reductions because of stream channel sediment release of P. If the model selected for the TMDL is calibrated with pre-2004 data, it will not represent current conditions. In fact, calibrating the model under pre-2005 conditions could result in boundary condition failures for validation. Page 51, Section 4.1: Aqua Terra has selected a model calibration time period of 2001 to 2009 and a validation time period of 1992 to 2000. While these calibration/validation steps are appreciated, we have questions regarding how Aqua Terra plans to address changes to WWTP discharges during the calibration period.

7. Previous Arkansas stakeholder review comments have asked how Aqua Terra will determine assumptions regarding poultry litter management practices. This topic is addressed in the Simulation Plan, as described below.

Page 77, Section 6.3. This section describes Aqua Terra's overall approach to representing poultry litter application in the watershed. Currently the plan is to develop litter application rates from data supplied by the Arkansas Natural Resources Commission (ANRC) and the Oklahoma Department of Agriculture, Food and Forestry (ODAFF). Comment: Table 6.1 presents the data that have been acquired to date; however, the table is identified as being preliminary in nature and "somewhat incomplete." The methodology used to develop application rates will need to be further explained once a full data set is acquired. Aqua Terra reports that litter exports (via trucks) from the Illinois River Watershed have grown substantially in recent years, particularly during the proposed model calibration period. How will the model represent changing application rates in the watershed as a result of the increase in litter export?

8. Page 19, Section 2.3. Paragraph 2 states "There appears to be adequate periods of record for three to five calibration sites within each state, if project resources support this level of calibration effort." Comment: We would like to reiterate that the costs to stakeholders resulting from implementation of this TMDL could potentially be measured in the millions of dollars, and the modeling effort should not be limited by project resources. The number of sites to be used for calibration should be based on the number required to create a sound and defensible model.

9. Page 26, Section 2.5. This section discusses the availability of water quality data for point sources within the watershed. Comment: Currently, the report indicates no water quality data are available for one of the largest contributing point sources in the watershed, the SWEPCO electric generating facility. How does Aqua Terra plan on addressing this large data gap?

10. Previous Arkansas stakeholder review comments have raised concerns regarding the stated objective of the modeling effort "to develop a scientifically robust and defensible watershed model to determine reductions in phosphorus loads needed to meet water quality standards in both states, Arkansas and Oklahoma." There are several portions of the Simulation Plan that are noteworthy in this regard, as described below.

    Page 82 Section 6.4. Paragraph 6 states "Based on recent historic data, it is expected that model results will show values in excess of 0.037 mg/l, and thus selected source reductions (or combinations) will be implemented in Arkansas upstream of the state line to assess what level of reduction is needed to meet the Oklahoma standard." The next paragraph states "Once one or more scenarios have been determined to meet the Oklahoma standard at the state line, their impacts on Lake Tenkiller will be assessed with respect to meeting its water quality standards for DO, Chl a, and Carlson's Trophic State Index. If Lake Tenkiller standards are not met, then further reduction will be implemented on the Oklahoma portion of the IRW, in combinations with the Arkansas-side reductions, until the lake standards are met."

    Comment: Based on the above paragraph it would appear that all reductions in loading will be required to take place on the Arkansas side while Oklahoma sources will only be required to reduce loading if water quality requirements in the lake are not met. This statement indicates a predisposition to focus on load reductions in Arkansas, without requiring the same restrictions on entities in Oklahoma. Given that nearly 70 miles of the Illinois River flows through Oklahoma, this appears to be a biased initial assumption for modeling alternatives. Additionally, Arkansas stakeholders continue to raise concerns regarding the appropriateness of a 0.037 mg/L total phosphorus standard for the Illinois River in Oklahoma.

Thank you for the opportunity to provide these comments, and we appreciate your consideration of these comments as modeling efforts move forward. In conclusion, we would like to reiterate our overall concern related to uncertainty analysis based on our review of the QAPP and Model Simulation Plan. When considered cumulatively, we are concerned about the many statements regarding scarcity and quality of basic watershed data being used for modeling and believe that an uncertainty analysis similar in nature to that discussed on pg. 51 of the QAPP is absolutely necessary to understand how much confidence stakeholders will have in the results from the model.

CITY OF
Siloam Springs
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October 24, 2011

Mr. Miguel Flores, Director
Water Quality Protection Division
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

VIA ELECTRONIC COPY

Re: Comments on —Simulation Plan for Water Quality Modeling and TMDL Development for the Illinois River Watershed and —Quality Assurance Project Plan: Modeling QAPP - Prepared by Aqua Terra Consultants

Dear Mr. Flores,

The City of Siloam Springs, Arkansas appreciates the opportunity to provide comments on the referenced documents prepared by Aqua Terra Consultants.

Illinois River Watershed TMDL Review

Simulation Plan

1. Paragraph 1 of Page 1 states that the objective of the TMDL; "Ultimately, the intent is development of a tool that can lead to scientifically sound TMDLs and a basin-wide water quality restoration plan." The Simulation Plan should be amended to acknowledge that a "basin-wide water quality restoration plan" cannot be prepared solely from the results of the TMDL modeling. It is absolutely necessary that on-the-ground assessment and evaluation of sources in key areas be evaluated to validate the model findings. Otherwise, implementation may be focused on source reductions that achieve little improvement in the Illinois River.

2. The second paragraph on Page 27 notes a lack of point source phosphorus data from POTW's prior to 1996. Great care needs to be taken in filling this data gap, to ensure reasonable values are utilized, such that the POTW loading to the system is not over, or under, estimated.

3. Section 3.4.1 discusses channel characteristics and hydraulics that pertain to sediment transport, and ultimately phosphorus transport. The description of the channel hydraulics indicates that a single cross section (at the outlet to the reach, will be used to establish the channel dimensions for the entire reach. If a reach is defined by a single HRU, then the entire HRU will have the same channel dimensions. This approach is inadequate in that it does not resemble reality, as streams in this ecoregion are dominantly riffle-pool complexes and are generally represented by a series of riffles, pools and runs. The creation of average channel morphology for each reach could eliminate the deeper pool sections that will serve as long term sinks for sediment. In addition, the elimination of the shallow riffle sections that generally contain the most benthic algal, will skew the productivity predictions. At a minimum each reach should contain a "pool" component and a "riffle-run" component to account for these very different hydraulic channel features.

4. According to Section 3.4.1 the channel in each reach will be represented as a trapezoid with the bottom width equal to the bankfull width, determined (or estimated) from some existing data source. Use of the bankfull width as the bottom width will generally tend to increase cross sectional area, thereby increasing shear stress, which will then increase bottom scour during rain events transporting more sediment downstream. Bottom widths should be adjusted based on bank slope to correct this problem.

5. Section 3.5 states that "Comprehensive modeling needs to consider ALL potential sources of phosphorus in order to accurately represent the relative contributions and impacts of any single source." A major source of sediment and phosphorus that has not been considered is stream bank erosion. Several studies have been completed in the Illinois River watershed that indicate that stream bank erosion could be the single largest contributor of sediment and one of the top three contributors of phosphorus. However, no effort appears to be included in the TMDL to quantify this component. If a source as large as stream bank erosion is omitted from the TMDL, it will not be possible to "...accurately represent the relative contributions and impacts of any single source."

   There are at least three (and possibly many others) possible avenues to include bank erosion in the TMDL modeling. The first would be to add a new sub-routine to the model specifically to address bank erosion. This option would take considerable time to program, test and validate prior to its usage in the TMDL. The second would be to add sediment and nutrient loads from bank erosion into the stream channel incrementally, as is being done for atmospheric deposition or a ground water source. The third, would be to treat stream channels as a separate land use, much like is suggested for unpaved roads. Each of these possible options would require that some sediment load data from bank erosion be available as well as sub-surface soil nutrient content (that not directly associated with manure). There are several studies cited in Section 3.4.1 of the Simulation Plan that were used to develop channel characteristics for the HSPF model, that were all originally focused on stream bank erosion in the Illinois River watershed. Erosion rates should be available from those sources or from other scientific literature sources.

If no reasonable data is found that could be used, with some level of confidence in the model, then the TMDL should be put on hold until accurate bank erosion data can be collected for use in the TMDL modeling. Failure to consider phosphorus and sediment contributed to the system by stream bank erosion would be an insuperable flaw in the modeling process and resulting TMDL.

6. Section 4.3 describes the water quality calibration procedures. One of the main calibration components is comparison of non-point source loading rates from each land use to the expected values. The expected values are noted as "highly variable". If a significant source of sediment and nutrients (i.e. bank erosion) is left out of the modeling, it is likely that erroneously high loading rates (export coefficients) will be utilized in the model to account for the load of TSS and nutrients that are actually coming from another source. These erroneously high rates will not be detected by the modeler as a problem, since the literature value range is broad and may easily encompass the utilized rates.

7. Considering that the headwater inputs to the EFDC lake model originate from the results of the HSPF model, the EFDC model will not provide accurate results if the HSPF model is inaccurate.

8. Section 5.5 of the Simulation Plan cites a turbidity standard in Lake Tenkiller of 25 ntu that is one of the targets of the TMDL. Neither the HSPF model nor the EFDC model performs prediction for turbidity. It is possible to use TSS or Secchi depth as a surrogate for turbidity, however, the accuracy of the relationships is questionable. A new method of assessing attainment of the 25 ntu turbidity standard for the TMDL may be required. No mention of the targets for the other Oklahoma water quality standards are discussed in the Simulation Plan. It is difficult to assess the ability of the EFDC model to predict the proper water quality constituents at the proper locations in the lake if details of the standards are not discussed along with the way comparisons will be made. This issue should be addressed in the Simulation Plan.

9. Sections 6.2 and 6.3 discuss phosphorus sources and the way poultry litter will be represented in the model. There is no discussion of bank erosion as a source. There is mention of "other animal wastes" as a source, which includes cattle, but no discussion anywhere in the Simulation Plan of how the cattle manure (which is the second largest source of animal based nutrients in the watershed) will be applied to appropriate land uses. It can be assumed that the cattle manure will be spread evenly in the each HRU, according to cattle density in those areas. However, how will the nutrients from cattle then be separated from poultry nutrients? The detail provided in the Simulation Plan for poultry liter leads one to assume that it is a major focus of the TMDL, which would seem to bias the results of the study. This issue needs to be clarified and discussed in the Simulation Plan.

10. Section 6.4 discusses the TMDL development and the modeling scenarios that will be reviewed. There is a suggestion that the baseline condition will be set to "current conditions", and that will likely be for the year 2011. This is reasonable. The section also discusses how the model will be run to assess potential load reductions needed to meet the 0.037 mg/L phosphorus standard at the state line. It is indicated that load reductions in Arkansas will be required until the 0.037 mg/L standard is met. It is not clear how the standards in Lake Tennkiller will be met. Will this be solely through reductions in Oklahoma? What will happen if the modeling shows that the reductions in Arkansas to meet the 0.037 mg/L standard allow the lake standards to be met as

well? Will Oklahoma be required to equally share in load reductions to protect and improve the Oklahoma portion of the watershed? These issues need to be resolved on the front end of the TMDL and discussed in the Simulation Plan.

Modeling QAPP

1. Sections 3.5 and 3.6 of the QAPP discuss the public comment opportunities and deliverable schedule. There will be a draft TMDL provided for stakeholder review somewhere around December 2011. The OWRB is in the process of reviewing their scenic rivers phosphorus standard (0.037 mg/L) and are not expected to conclude the process for approximately six months. Should the TMDL proceed with the potential for the standard at the State line to change in about six months? This issue needs to be addressed and the Simulation Plan and QAPP amended.

2. Section 6.2 discusses model calibration. Considerable effort is expended in describing how soil (sediment) and associated nutrients will leave an agricultural site in an HRU and enter the stream channel. How will the original source of the nutrients leaving the site be determined? Will it be assessed as a ratio of pounds applied per acre per source type? The different composition of manures (cattle, hog, poultry, etc.) and commercial fertilizers provide for a different integration into the soils and ultimately a different rate of export into the stream channel. How this issue will be addressed in the modeling should be addressed in the Simulation Plan and the QAPP.

   There is little discussion of how sediment and nutrient loads from urban land uses will be applied in the model. It is of significant importance that accurate storm loading from urban areas be included as a source in the TMDL. Urban areas have been shown to contribute high levels of nutrients (higher than some agricultural watersheds) to stream systems and to contribute unnaturally high peak flows that have a dramatic affect on channel scour and bank erosion.

   This section also discusses in-stream sediment transport calibration as it relates to particle size and channel shear. The calibration will evaluate sediment loading overall and during storm event hydrographs. In order to accurately represent sediment transport from a storm event it is necessary to have in-stream data, during that event, for water quality, flow, velocity, and cross sectional measurements so that shear stress can be calculated accurately. It is unlikely that such storm specific data is available from the existing historical data being used to develop this model. Therefore, the data should be collected in the field for use in the calibration.

   There is no discussion of the data source for stream shading to be used in the algal routines in the HSPF model. Stream shading is a key element for determination of benthic algae biomass, and its use should be discussed thoroughly in the Simulation Plan.

3. Section 6.4 of the QAPP describes the sensitivity analysis that will be completed as part of the TMDL modeling. A complete list of parameters that will be varied for the sensitivity analysis is not included in the QAPP or in the Simulation Plan. Therefore, a list of critical parameters that must be evaluated for sensitivity is included below. This list is not all inclusive but should be considered a critical starting point.
   a. shear stress (scour potential and deposition potential)

b. channel depth
c. velocity (or slope)
d. algal growth rate
e. shading
f. erosion rate from pasture
g. urban land use loading
h. poultry litter application rate
i. cattle manure application rate
j. BMP effectiveness
k. POTW loading
l. Rainfall run-off rate
m. Addition of an unknown source representing at least 25% of the annual load to Lake Tenkiller (to account for bank erosion if it is not integrated into the model).

4. Section 4.3 discusses model performance criteria and sums up the key question that should be carefully considered before the TMDL is completed. "Are the model results, as reflected in the calibration and validation comparison, of sufficient quality to be used in decision making for this study?" Or, should the modeling be put on hold until sufficient data/information can be collected to ensure the results are of "sufficient quality". Further discussion and consideration of these fundamental questions must be brought forward in the public participation process.

Again, thank you for the opportunity to comment.

Respectfully,

David Cameron, City Administrator
City of Siloam Springs, Arkansas

Cc: John Bailey, ADEQ (via e-mail)
Quang Nguyen, U.S. EPA Region 6 (via e-mail)
Curry Jones, U.S. EPA Region 6 (via e-mail)
Philip Hutchison, U.S. EPA Region 6 (via e-mail)

ADEQ

ARKANSAS
Department of Environmental Quality

January 14, 2010

Claudia Hosch (6WQ-P)
Associate Director
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Comments on the Memorandum for Model Selection for the Illinois River TMDL in AR/OK

Dear Ms. Hosch:

The Arkansas Department of Environmental Quality (ADEQ) would like to thank Region 6 Environmental Protection Agency (EPA) for allowing us to review and provide comments on Aqua Terra's November 22, 2010 draft "Model Selection for Illinois River Memorandum" (the Memo). Up to this point, EPA has responded only to comments on draft documents during conference calls. In an effort to provide clarity on the decisions that are made going forward, ADEQ requests EPA to provide written responses to our comments. We also ask EPA to notify us when draft documents are finalized.

The following comments have been developed with Arkansas stakeholders, including Rogers Water Utilities (Tom McAlister, Director) and consultants to Rogers Water Utilities, including Professor Marty Matlock, P.E., of the University of Arkansas, Professor Larry Roesner, P.E., of Colorado State University, and Wright Water Engineers, Inc., of Denver (Jonathan Jones, P.E., D.WRE, and Jane Clary, CPESC, LEED AP). Our comments include general and specific comments on the draft Model Selection Memo, as well as issues that we believe must be addressed in the forthcoming Model Simulation Plan. We hope these comments foster the information exchange necessary to ensure the usefulness of the models selected. Throughout this process, we will continue to emphasize that model outcomes are dependent upon the comprehensiveness and accuracy of the data utilized in calibrating and validating the models, and more importantly the capability of the models to simulate current conditions in the watershed for purposes of TMDL development.

Model Selection Memo

In general, we concur that the models selected in the Memo appear to be appropriate for the Illinois River Watershed, given the advantages and disadvantages characterized in the report. The selection of the Hydrological Simulation Program – Fortran (HSPF), integrated into BASINS, for watershed modeling is reasonable if the calibration and validation processes are transparent and well documented and funded at a level to enable Aqua Terra to conduct the analysis with full rigor.

The selection of Environmental Fluids Dynamic Code (EFDC) for lake modeling is reasonable for lake hydrodynamics and water quality simulation. This model would be most advantageous in three-dimensional analysis; however, detailed bathymetry and sectional monitoring of Lake Tenkiller have not been conducted for more than 15 years. The sediment and nutrient regimes of the riverine, transitional, and lacustrian zones have changed in that time period. These data are critical for understanding and modeling the ecological productivity and hydrogeobiochemical elements in EFDC when analyzed at three dimensions. Adequate time and resources should be allocated to this project to obtain the needed data.

We submit the following specific questions and comments associated with the Model Selection Memorandum, followed by comments addressing important issues associated with the forthcoming model simulation plan, data adequacy and the inclusion of Lake Tenkiller in the modeling effort.

1. Page 1, Third Paragraph: This paragraph describes changes that have occurred in Arkansas related to "fast-growing urban areas" and "intensive agricultural animal production." Have there been changes in Oklahoma that should be similarly described? Further the geomorphological characteristics of the Illinois River in Arkansas are vastly different than the geomorphological characteristics of the Illinois River in Oklahoma. These differences should be characterized in the Memo.

2. Page 1, Fourth Paragraph: This paragraph notes the Illinois River in Arkansas is not listed as impaired for Total Phosphorus (TP) but states "several" tributaries to the Illinois River in Arkansas are impaired for TP and lists three examples (which happen to be the only examples possible). ADEQ has on numerous occasions maintained that these three tributaries have met and currently meet all their designated uses, and these tributaries have not been included on any Impaired Water Bodies List through an independent action of ADEQ. EPA added these three segments to Arkansas' previous 303(d) lists and supported its listing of these streams for TP by comparing ambient monitoring data with the national criterion for TP. However, neither ADEQ nor EPA has adopted this national criterion as the numeric water quality standard for TP. Arkansas' water quality standards contain a narrative nutrient standard—not a numeric TP standard. Consequently, the Memo should be revised to reflect that, prior to the 2010 303(d) list, three (not "several") streams were added by EPA to Arkansas' 303(d) list and, furthermore, it has been demonstrated through an intensive two year study concluding in 2009 that two of those tributaries (Osage and Spring Creeks) meet all designated uses and are not impaired by TP.

3. Page 5, Third Paragraph: The report references the "Illinois River Watershed Partnership Watershed Management Plan." How does Aqua Terra currently envision that this watershed management plan will interface with the development of models to support the TMDL?

4. Page 28., #5: How will cyanobacteria be addressed since EFDC does not simulate cyanobacteria?

Model Simulation Plan

While the models selected are considered reasonably appropriate for modeling conditions in the basin, the usefulness of these models will be contingent on the proper use of the most recent existing data, model calibration and validation, and explicit incorporation of uncertainty for modeling results. While these issues are anticipated to be addressed in the forthcoming Model Simulation Plan, the following comments are provided to EPA to aid in the preparation of that plan.

1. It will be important to document how agricultural loadings and BMP practices are being simulated in the HSPF model.

2. Page 7, Table 2.2 states that Basins/HSPF can provide "detailed instream routing and WQ processes, including sediment-nutrient interactions." Similarly, page 13 states, "The sediment transport and instream water quality capabilities of HSPF provide a better process-based representation of the fate and transport processes for nutrients, including phosphorus, along with sediment-nutrient interactions and scour/deposition impacts with the sediment bed. This is expected to provide an improved simulation of both point source and nonpoint source contributions of phosphorus both to the OK/AR state line and to Lake Tenkiller." Can these sediment-nutrient interactions and scour/deposition processes be accurately simulated in the Illinois River Watershed? We believe this is an important issue, given that much of the phosphorus movement will be in association with sediment. We request EPA to provide more information regarding how this will be accomplished in the Model Simulation Plan.

3. Pages 12 and 13, Bullet Points Comparing HSPF and SWAT Models: Ability to model karst topography is not included in this list. Will HSPF be able to adequately incorporate surface water/groundwater interactions and are there enough data to provide calibration and validation of this important factor? We request EPA to further describe how this issue is addressed in the Model Simulation Plan.

4. The minimum level of rigor for allocation of loads in a complex watershed TMDL should be calibration and validation over the range of expected outcomes. A suite of calibration metrics should be applied to analyze these processes: hydrology (base flow and storm conditions) and water temperature (indicator of groundwater and interflow calibration) at each USGS gauging station; land-based constituent loading parameters; in-stream processes including sediment and nutrient biochemical processes; and biotic processes, including chlorophyll density and concentrations.

5. Both models should be calibrated and validated across conditions that bracket existing and expected future conditions, to the extent feasible. Using a model to predict a parameter or condition outside the range of calibration is not an appropriate level of rigor, given the substantial potential investments that may be necessary to reduce loads as a result of model outcomes. The challenge for Aqua Terra in the Illinois River Watershed is that conditions have been changing significantly for the last 10 years. Phosphorus

loads from point and nonpoint sources have been decreasing, sediment loads predominantly from hydrologic regime alteration have been increasing, and stream bed sediment and gravel loads have been increasing, while size has been decreasing. Riparian cover has decreased across the upper Illinois River Watershed. Calibration and sensitivity analysis using data from before 2004 will not represent the current and future condition of this ecosystem.

6. Sensitivity analysis should be performed for both models as part of the calibration and validation process. The most sensitive input variables that impact the outcome parameters of concern should be characterized for each of the bracketed conditions. The relative sensitivity of each input variable should be stable across simulated conditions.

7. Uncertainty analysis should be performed to determine the variability and uncertainty in model outputs associated with variability and uncertainty in model inputs. Without uncertainty analysis, the utility of the model to predict outcomes for critical parameters is compromised. Any remediation strategy should predict outcomes that are significantly different from current conditions. Failure to predict significant changes in outcome parameters undermines the utility of the model for policy development.

8. For the reservoir modeling, the simulation plan should address reservoir operations and management options as part of the long-term strategy for protecting lake water quality.

ADEQ emphasizes the critical importance of the proper use of existing data, model calibration and validation, and performing the sensitivity analysis and uncertainty analysis. We highlight the importance of all these steps, in part, due to a statement made in the "Quality Assurance Project Plan Water Quality Modeling and TMDL Development for the Illinois River Watershed" (Aqua Terra December 15, 2009). This document acknowledged the need to consider sensitivity analysis and uncertainty analysis, but qualified this need with the caveat, "Subject to the concurrence of the EPA WAM and subject to budget limitations..." **Limited time and resources must not impede the proper development, calibration, and validation of the HSPF model.** We ask EPA and Aqua Terra to review the existing schedule and budget to determine whether the proposed schedule and funding are adequate to accomplish the goals of the project—that is, to develop reliable hydrologic and water quality models for this extensive and complex hydrologic area, including a large reservoir. If schedule and budget are not adequate, we ask EPA and Aqua Terra to determine how much additional time and funding are required to adequately accomplish the project goals or how this project can be modified to ensure the proper development, calibration and validation of the watershed model.

We believe the project schedule provides that a draft "Simulation Plan" will be available within four to six weeks. ADEQ respectfully requests adequate time to review this very important document with the Arkansas stakeholders. Accordingly, we ask that a minimum of six weeks be provided for review and comment on that document

Data Adequacy Issues

On page 28 of the Memo, Aqua Terra states, "We believe that adequate data are available to support application of either [lake] model." ADEQ previously provided to EPA comment letters from Arkansas stakeholders raising concerns about data adequacy for model development and

calibration (see Attachments 1 and 2 to these comments) Formal responses to these comments have not been provided by EPA, so it is not clear how these issues are being resolved. These data adequacy issues are not repeated in this comment letter, but remain substantial concerns. Irrespective of which models are selected, there must be adequate physical, chemical and biological data to assure that the models realistically represent the Illinois River, its major tributaries and Lake Tenkiller. Representative areas of concern include:

1. Use of current land use conditions, particularly given significant changes in land use in recent years and changes projected to occur in the coming years.

2. Use of the most current and comprehensive water quality data (see specific comments in Attachments 1 and 2). The project should reflect current water quality conditions, including recent data, and not rely on historical data or extensively on reference stream data.

3. Use of the most reliable rainfall source, which is believed to be NexRad.

4. Use of an appropriate data quality screening process.

5. Full consideration and incorporation of all nutrient sources around Lake Tenkiller in Oklahoma, in addition to those addressed for the main stem of the Illinois River.

Lake Tenkiller

As a final point, it seems important to again address the issue of Lake Tenkiller. Although including the lake was contemplated in the Project plan, modeling Lake Tenkiller appears to be an entirely separate project from the Illinois River TMDL. The lake's inclusion is important for Oklahoma, but this modeling effort seems to range far beyond the scope of EPA's Illinois River TMDL and may divert limited resources needed to achieve the Project's objectives. ADEQ has previously indicated that it has no objection to including Lake Tenkiller (see attached December 1, 2010 letter), assuming the results of that modeling effort have no impact on the Arkansas portion of the Illinois River. However, if modeling the lake consumes scarce resources needed to achieve reliable watershed modeling results for TP in the Illinois River, then the lake modeling may have unintended adverse impacts on Arkansas. In short, if time and financial constraints require the Project to be modified, a logical place to "cut-back" would be in the lake modeling. It has been our understanding that the purpose of the Illinois River TMDL Project was to address the impairment in the Oklahoma portion of the Illinois River due to the exceedance of the 0.037 mg/L *total phosphorus standard* established for Oklahoma's Scenic Rivers. The Scenic River designation for the Illinois River ends at the confluence of Baron Fork (upstream of Lake Tenkiller). Lake Tenkiller is neither a Scenic River nor does it have any applicable total phosphorus water quality standard. Furthermore, Lake Tenkiller is not listed on Oklahoma's 303(d) list as impaired for TP. For these reasons, the lake modeling would appear to be outside the scope of EPA's proposed Illinois River TMDL Project and should not be included if doing so diverts limited resources from the principal project purposes. For clarification, we ask EPA to explain how the Lake Tenkiller water quality standards interface with the 0.037 mg/l TP goal (at the state line).

Again, we thank you for the opportunity to provide comments and look forward to working with EPA as it proceeds to finalize the Model Selection Memo and begins drafting a Simulation Plan. If you have any questions concerning these comments, you can contact me by phone at (501) 682-0629 or by email at the following address: bailey@adeq.state.ar.us

Sincerely,

John Bailey, P.E.
Permits Branch Manager, Water Division

Attachments:

1. January 6, 2010 Letter from 2010 Letter to Mr. John Bailey, Arkansas Dept. of Environmental Quality from Tom McAlister, Rogers Water Utilities Regarding Comments on the Draft Illinois River Phosphorus TMDL QAPP.
2. August 30, 2010 Letter to Mr. John Bailey, Arkansas Dept. of Environmental Quality from Tom McAlister, Rogers Water Utilities Regarding Comments on Draft Preliminary Data Review and Analysis for Water Quality Modeling and TMDL Development for the Illinois River Watershed.
3. December 1, 2010 Letter to Miguel I. Flores, USEPA Region 6 from J. Ryan Benefield, P.E., Deputy Director, ADEQ Regarding EPA's Illinois River TMDL Project.

cc: Teresa Marks, Director, ADEQ
Ryan Benefield, P.E. Deputy Director, ADEQ
Steve Drown, Water Division Chief, ADEQ
Sarah Clem, Water Quality Planning Branch Manager, ADEQ
Robert George, V.P. & Associate General Counsel, Tyson Foods, Inc.
J. Randy Young, P.E., Executive Director, ANRC
Tom McAlister, Director, Rogers Water Utilities
Steven A. Thompson, Executive Director, Oklahoma Department of Environmental Quality
J.D. Strong, Water Board Director, Oklahoma Water Resource Board
Tom Elkins, Administrator for Cherokee Nation Environmental Programs, Cherokee Nation
Brandi Ross, Natural Resources director, United Keetoowah Band